PRESENCE OF *CAULERPA RACEMOSA* IN THE NORTH-WESTERN MEDITERREAN

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ABSTRACT - The occurrence near Livorno (Ligurian Sea, Italy) of *Caulerpa racemosa* (Forsskål) J. Agardh (Chlorophyceae, Caulerpales) is reported. Up to now, the southeastern Mediterranean has constituted the northernmost limit of distribution of this species, as indicated by previous algological studies. The hypothesis that the distribution of *C. racemosa* could spread, is put forward. The characteristics of this alga and its habitat are described.

RÉSUMÉ - Des peuplements de *Caulerpa racemosa* ont été trouvés à proximité de la ville de Livourne (Mer Ligurienne, Italie). Jusque là les côtes sud-orientales de la Mer Méditerranée représentaient la limite septentrionale de sa distribution. Cette espèce semble donc être en voie de d'extension. Les caractéristiques de cette algue et son habitat sont décrits.

KEY WORDS - *Caulerpa racemosa*,Chlorophyta, Northwestern Mediterranean Sea, biogeography.

INTRODUCTION

Caulerpa racemosa (Forsskål) J. Agardh is a tropical alga of wide distribution, very common in the Red sea (Rayss, 1941; Cirik & Öztürk, 1991).

In spite of its relatively frequent occurrence along the southern and eastern Mediterranean, this species has not been previously recorded in northern Mediterranean. To date, it has been found in areas of Tunisia (Hamel, 1926, 1930, 1931; Ben Alaya, 1971; Ben, Maiz *et al.*, 1987), Egypt (Aleem, 1948, 1950), Syria and Lebanon (Hamel, 1930, 1931; Lami, 1932; Rayss, 1941; Aleem, 1950; Mayhoub, 1976), south Italy (Syracuse and Pelagean Island) (Alongi *et al.*, 1993) and on the greek coasts (Panayotidis & Montesanto, 1994); a reduced form, *C. racemosa* var. *lamourouxii* (Turner) Weber van Bosse fa. *requienii* (Montagne) Weber van Bosse was found in Syria (Huvé, 1957), Israel (Rayss & Edelstein, 1960; Lipkin & Friedmann, 1967) and Turkey (Huvé, 1957; Cirik & Öztürk, 1991) (Fig. 1).

Specimens of *C. racemosa* were collected on the rocky shoals of Meloria near Livorno (Ligurian sea, Italy) during a *Caulerpa taxifolia* (Vahl) C. Agardh surveillance campaign in the Mediterranean. In this paper we describe its morphology and the habitat.

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Fig. 1 - Map showing the distribution of *Caulerpa racemosa* (Forsskal) J. Agardh in the Mediterranean sea (our record; ■ previous records).

MATERIALS AND METHODS

Thalli of *Caulerpa racemosa* were collected using SCUBA between September 1993 and January 1994 in the infralittoral zone, at 4 m depth, in a moderately exposed area of the Meloria Shoals just off Livorno (Fig. 2). In this area, colonized by a *Posidonia oceanica* meadow, it forms a dense population which covers the dead « mattes » patches, intermingled with an algal community dominated by *Acrothamnion preissii* (Sonder) Wollaston, *Flabellia petiolata* (Turra) Nizamuddin, *Plocamium cartilagineum* (L.) Dixon and *Cladophora* spp. Kützing. Collections were preserved in 4% formalin seawater. For morphological observations of the plastidome, squash preparations were stained with an iodine solution. Dried and picked specimens are located in the Herbarium of the Department of Territorial and Environmental Sciences (University of Pisa). Photographs were taken with a Nikon camera. Freshly collected plants were transplanted to ▬ aquarium and cultivated at 20°C under 15-20 $\mu E.m^{-2}\ s^{-1}$ with a 12:12 L:D photoperiod.

OBSERVATIONS

Plants form large flat tufts, 10-15 cm thick. Thallus (Fig. 3) is composed of 0.9-1.1 (2) mm thick stolons fixed by numerous well developed and finally ramified rhizoids; erect axes, 2-3 (5) cm high, bear vesicle-like branchlets on longitudinal rows. Branchlets are 4-5 mm long and spherical parts are 4-5 mm long and spherical parts are

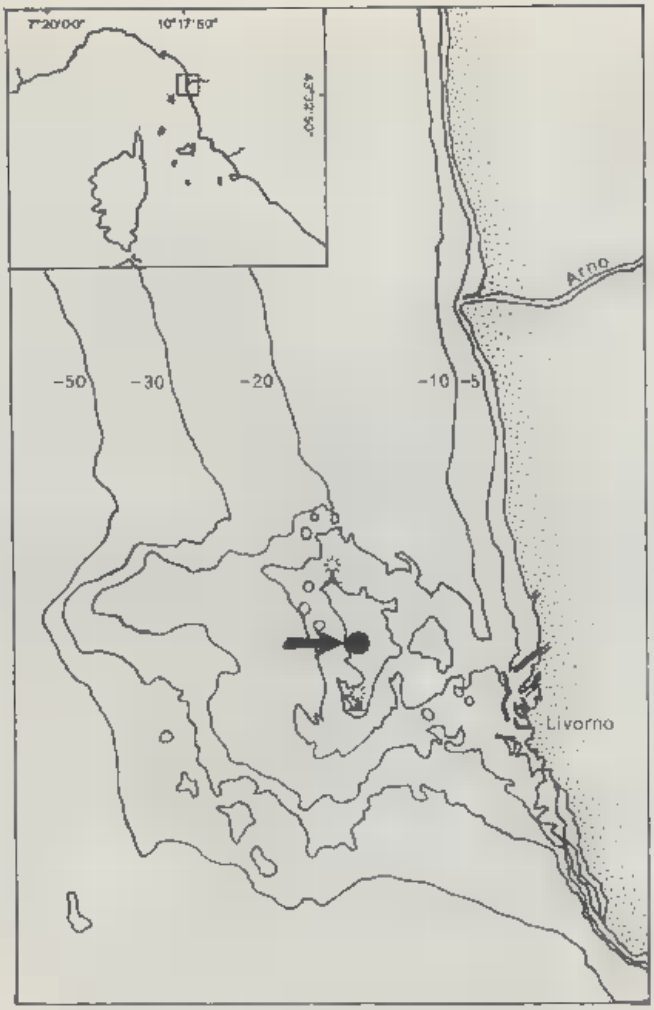

Fig. 2 - Map showing the locality of collection (arrow) of *Caulerpa racemosa*.

2-3 mm wide. The chloroplasts (devoid of pyrenoids) are subovoid 3(6) µm long and 2(4) µm broad while leucoplasts are 10 (14) x 5(7) µm. Specimens collected in the Meloria area compared well with *Caulerpa racemosa* var. *racemosa* according to the description of Coppejans (1992) however thalli are higher compared with the tropical forms. Under aquarium condition, at a light intensity lower than that typical of their natural habitat, the plants change their form and produce 10 cm high high erect cylindrical assimilators completely bare or with rare opposite vesicle-like (1 mm wide) branchlets (Fig. 4).

DISCUSSION

In the recent decades, a variety of tropical algae have proliferated in the Mediterranean sea due to acciental introduction or have penetrated from the Red sea via the Suez Canal (Hamel, 1931; Rayss, 1941; Aleem, 1948). A large number of them,

Fig. 3 - *Caulerpa racemosa* collected in the Meloria area; thallus grown on a dead rhizome of *Posidonia oceanica* (L.) Delile. Bars = 1 cm.

however, have been limited to the southern and eastern shores (Aleem, 1948; Meinesz & Hesse, 1991).

Recently in the northwestern Mediterranean, in particular near Livorno, several new species have been found: *Acrothamnion preissii* (Sonder) Wollaston (Cinelli & Sartoni, 1969), *Polysiphonia setacea* Vallenberg (Airoldi *et al.*, in press), *Caulerpa taxifolia* (Meinesz *et al.*, 1993). In this area, *C. racemosa* seems to have spread fairly recently since 1971 (Cinelli, 1971). The occurrence of *C. racemosa* in the Meloria area extends its distribution to the northwestern Mediterrancan. Moreover, the presence during winter of the typically well developed mature forms does not seems to be in agreement with the hypothesia that species live under suboptimal conditions in the northernmost Mediterranean (Lipkin & Friedmann, 1967). The unbranched thalli, grown under aquarium conditions, show characteristics similar to those described for juvenile stages by Lipkin & Friedmann (1967). This phenomenon reconfirmed that the morphological plasticity of this species may be affected by environmental parameters, as previous culture studies have demonstrated (Ohba & Enomoto, 1987; Peterson, 1972; Calvert, 1976).

Fig. 4 - Juvenile thallus of *Caulerpa racemosa* grown under aquarium conditions. Bar = 1 cm.

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